

AMENDMENTS TO THE APPENDIX

The present invention discloses an acoustic borehole source and method of using the source for generating elastic waves through an earth formation that may be used for logging or permanent installations. The acoustic source is comprised of a first motorized reaction mass and at least two pads, each pad connected to the sonde and the motorized reaction mass using pushing rods. In an alternate embodiment, the source has a first and second motorized reaction mass and at least two pads. The motorized reaction masses may be activated to allow the pads to move at an angle α relative to the axis of the sonde. In a third embodiment, the acoustic borehole source includes additional pairs of motorized reaction masses so that pads may be independently activated.

REMARKS

Pending in the application are claims 1-47, of which claims 1, 8, 18, 23, 31, 34, 37, 41, 43 and 45 are independent. The following comments address all stated grounds for rejection and place the presently pending claims, as identified above, in condition for allowance

Objections to the Abstract:

The Abstract has been objected to for exceeding 150 words. Applicant submits an amended Abstract which is below 150 words. In view of this newly amended abstract, Applicant believes that the Examiners objection has been overcome.

Informality Objections to claim 18

Claim 18 has been objected to due to a typographical error. Application submits amended claim 18, wherein the term "a first reaction masses" has been replaced with "a first reaction mass." In view of this amendment, Applicant submits that the Examiners Objection has been overcome.

Rejections Pursuant to 35 U.S.C. §102(b)

The Examiner rejected claims 1-4, 8-10, 12-14, 18-19, 23-25, 27, 31-36, and 41-44 pursuant to 35 U.S.C. §102(b), as being unpatentable over U.S. Patent No. 4,715,470 to Paulsson (Hereinafter Paulsson). Applicants respectfully traverse this rejection

The present invention, recites an acoustic borehole source and method of using the source for generating elastic waves through an earth formation. The acoustic source is comprised of at least a first motorized reaction mass, as recited in the pending independent claims, and at least two pads. The motorized reaction mass is positioned along the axis of the sonde. Furthermore, the pads are connected to the sonde and the motorized reaction mass using *variable angle* pushing rods. The pad and *variable angle* pushing rod arrangement allows for the generation of elastic waves through the earth formation upon activation of the motorized reaction mass. Furthermore, by controlling the angle of the *variable angle pushing rods*

impedance of the present invention may be controlled for using in a variety of earth formations having variable impedance properties. Applicant respectfully submits that the variable angle pushing rod and impedance control arrangement is recited in presently amended claims 1, 8, 18, 23, 31, 34, 37, 41, 43 and 45, all of which are independent.

Summary of Paulsson

The cited reference to Paulsson recites a downhole seismic source capable of generating seismic forces for use in making seismic measurements. Paulsson includes a seismic source having an outer housing, a fixed angle means for clamping the source securely to the wellbore, and a linear electromagnetic actuator which utilizes permanent magnetic material having remanent magnetic field exceeding about 0.9 T such as rare earth permanent magnetics.

Arguments

Applicants respectfully submits that the cited art to Paulsson fails to recite or disclose each element of the presently amended claims. Firstly, Applicant submits that Paulsson fails to recite the variable angle pushing rod and pad arrangement of the present invention. Such an arrangement is clearly recited in the pending independent claims and fully supported by the specification as filed. Additionally, by controlling the angle of the pushing rod, the impedance of the acoustic borehole source may be controlled. As recited in the specification at pages 9-10, "It is noted that specific pad/motor configurations may be preferred depending on the nature of the formation encountered, for example to adapt the impedance in a soft formation." Control of the variable angle pushrod and pad assembly, as illustrated in Figure 4 of the present invention, illustrates the relationship between the variable pushing rod angle and the source impedance. In one example, when encountering a soft formation a small alpha angle may be utilized to generate a best sonic signature in the borehole using the borehole source of the present invention. In contrast, a very hard formation may require an alpha angle approaching ninety degrees for best use of the present invention.

In contrast, Applicant respectfully submits that the Paulsson reference solely recites a clamping means wherein the angle of the clamping means is fixed. Once such example of this

fixed clamping means is noted by the Examiner at Column 2 lines 58-59 of Paulsson, wherein a hydraulic actuated piston is detailed. Furthermore, as illustrated in Figures 1 and 3 of Paulsson, the clamping means is fixed at a perpendicular angle to the body of the seismic source. As Paulsson fails to recite or disclose the variable angle pushing rod arrangement of the present invention, wherein this variable angle pushing rod is utilized in controlling the impedance of the acoustic source, Applicant believes that the Paulsson reference fails to anticipate presently pending independent claims 1,8,18,23,31,34,37,41,43 and 45. Applicant therefore respectfully requests that the Examiner withdraw the rejection to these claims and pass them to allowance. Applicant further submits that dependent claims 2-7, 9-10, 12-14, 19, 24-25, 27, 32-33, 35,36, 42 and 44, which rely on the aforementioned independent claims for support, are in condition for allowance as they serve to further limit an allowable independent claim. Applicant requests that the rejections to these dependent claims be withdrawn and that these dependent claims be passed to allowance as drafted.

Rejections Pursuant to 35 U.S.C. §103(a)

The Examiner rejected claims 5,15,20 and 28 pursuant to 35 U.S.C. §103 as being unpatentable over Paulsson in view of Nakajima (U.S. Patent No. 6,315,075) (hereinafter "Nakajima") The Examiner has further rejected claims 6-7, 11,16-17,21-22,29-30,37-40 and 43-47 under 35 U.S.C. §103 in view of Paulsson and further in view of Sakata (U.S. Patent No. 5,187,331, hereinafter "Stark"). For the reasons set forth below, Applicants respectfully traverse these rejections.

Summary of Nakajima

Nakajima recites a borehole tool which has an anchoring mechanism incorporated into the tool. The anchoring mechanism of Nakajima included a clutched drive mechanism such that the anchoring mechanism may be moved from an extended position to a retracted position within the tool body. Additionally, the anchoring mechanism of Nakajima is spring loaded such that the relaxed position of the anchoring mechanism is in an extended position. Using the clutched drive mechanism, the anchoring mechanism is retracted against the spring pressure for insertion into a borehole.

Arguments relating to pending claims 5,15,20 and 28

Applicants submits that the cited art to Paulsson and Nakajima, alone or in combination, fails to teach or suggest that which is claimed in the present invention. Applicant submits that dependent claims 5, 15,20 and 28 depend on currently amended independent claims 1, 8,18 and 23 respectively. Applicant submits that claims 1,8,18 and 23 recite an acoustic borehole source which includes a plurality of variable angle pushing rods, wherein the impedance of the acoustic borehole source may be controlled using these variable angle pushing rods.

In view of arguments set forth prior, Applicant further submits that the underlying independent base claim on which claims 5,15,20 and 28 depend are in condition for drafted. As claims 5,15,20 and 28 depend on and further limit these independent claims, Applicant submits that dependent claims 5,15,20 and 28 are in condition for allowance by their very nature as dependent claims. Applicant additionally submits that hinged connection between the pushing rods and the reaction mass, as recited in claims 5,15,20 and 28 provides for a variable angle between the pushing rods and the borehole. This variable angle, α , is illustrated in Figure 4 and provides for the alteration of the impedance of the acoustic source. In view of the aforementioned arguments relating to claims 5,15,20 and 28, Applicant submits that the cited references fail to teach or suggest the present invention. Applicant therefore urges the Examiner to withdraw these rejections and pass claims 5,15,20 and 28 to allowance.

Summary of Sakata

Sakata recites an earth mounted apparatus for generation of SH waves. This apparatus includes a driving plate coupled with a fixing device capable of attaching the driving plate to the *surrounding earth surface*. The driving plate further has several hydraulic actuators mounted to it which include reaction masses that act tangentially on the driving plate. A control device actuates these hydraulic actuators at a controlled frequency such that transverse waves are generated.

Arguments relating to pending claims 6-7,11,16-17,21-22,29-30,37-40 and 43-47

The Examiner has rejected dependent claims 6-7,11,16-17,21-22,29-30,37-40 and 43-47 in view of Paulsson and further in view of Sakata. Applicant respectfully traverses this rejection, and submits that the aforementioned independent claims are in condition for allowance as drafted. Applicant submits that dependent claims 6-7,11,16-17,21-22,29-30,37-40 and 43-47 reply on independent claims 1,8,18,23,31,34,37,41,43 and 45 for support. As set forth prior, Applicant respectfully submits that these independent claims recite elements neither taught nor suggested by the cited art. In view of this, Applicant believes that the presently amended independent claims are in condition for allowance. Applicant further believes that those dependent claims, which serve to limit the pending independent claims, are in condition for allowance by their very nature as dependent claims.

Applicant further submits that dependent claims 6-7,11,16-17,21-22,29-30,37-40 and 43-47 are further in condition for allowance as drafted as the cited art fails to teach or suggest each element of these claims. For example, dependent claims 7,17,21,29 and 30 recite motorized reaction masses designed to accommodate a specific source property. These motorized masses designed to accommodate a specific source property are located along the axis of the sonde. Applicant submits that the cited references fail to recite such a motorized reaction mass located along the axis of the sonde. Looking to column 4, lines 11-13 of Sakata, as cited by the Examiner, the reaction masses are located offset from the axis of the sonde. Additionally, claims 11,26, 45 and 47 recite multiple masses (i.e. a third or fourth mass). In accordance with the base independent claims on which they depend, these multiple masses are located along the centerline of the sonde. Again, Applicant respectfully submits that the location of a plurality of masses in accordance with the present invention is not taught nor suggested by the cited art, either alone or in combination. Furthermore, Applicant submits that the locating of masses away from the axis is explicitly taught by the Sakata reference. Applicant draws the Examiners attention to one such example, namely claim 1 of Sakata which reads:

“a plurality of hydraulic actuators *equidistantly mounted on a circumference* of said driving plate, which have *reaction masses and act tangentially on a same circumference from a center* of said driving plate”

In view of such language, Applicant submits that the cited art, when viewed either alone or in combination, fails to render claims 6-7,11,16-17,21-22,29-30,37-40 and 43-47 obvious. Applicant therefore urges the Examiner to withdraw the rejection under 35 U.S.C. §103(a) and pass claims 6-7,11,16-17,21-22,29-30,37-40 and 43-47 to allowance.

Conclusion

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Applicant believes no additional fee is due with this response. However, if a fee is due, please charge our Deposit Account N°. 19-0615, under Order No. 60.1531 from which the undersigned is authorized to draw.

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Respectfully submitted,

By 

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